

REMARKS

Reconsideration of the subject application is requested. Two changes of an editorial nature have been made to the specification as shown above. Claims 1, 2, 4-6, 15 and 17-30 are now pending in the application with claims 1, 6, 15, 17, 18 and 20 having been amended. New claims 22-30 have been added. Claims 3, 7-14 and 16 have been canceled.

New claims 22-29 correspond to original claims 7-14. New claim 30 includes the elements of original claim 1 and further requires that the flux transmitted to the soft magnetic underlayer reduces the distance between an image read element and the hard magnetic layer. The reduction in the distance between the image read element and the hard magnetic layer is discussed in the specification on page 6, at lines 15-22.

In Section 3 of the Detailed Action portion of the Office Action, the specification has been objected to because the title of the invention is not descriptive. A new descriptive title has been identified in the above amendment to the specification.

In Section 4 of the Detailed Action portion of the Office Action, claim 6 was objected to because of certain editorial informalities. These informalities have been corrected in the above amendment to the claims. The editorial change has been made to improve the clarity of the claim and is not related to the patentability of the claim.

In Section 5 of the Detailed Action portion of the Office Action, claim 20 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claim 20 has been amended to recite "at least one magnetic flux generating element" which has antecedent basis in claim 18. The editorial change has been made to improve the clarity of the claim and is not related to the patentability of the claim.

In Sections 6-7 of the Detailed Action portion of the Office Action, claims 1, 2, 15-18 and 20 have been rejected under 35 U.S.C. §102(b) as being anticipated by Yanagida (U.S. Patent No. 4,385,334). Applicants note that the Examiner misidentified the rejected claims in line 1 of Section 7 as claims 1, 2 and 7-18. The Examiner properly identified the rejected claims as 1, 2 15-18 and 20 in the remainder of Section 7. Yanagida has been cited as disclosing a perpendicular magnetic recording head having a read element having a first side and a second side and a first magnetic flux generating element spaced apart from the first side of the read element such that the first magnetic flux generating

element transmits a magnetic flux into the soft magnetic layer, and a second magnetic flux generating element spaced apart from the second side of the read element such that the second magnetic flux generating element transmits a magnetic flux into the soft magnetic layer.

The rejection under 35 U.S.C. §102(b) is traversed with respect to claims 1, 2 and 15-18 and 20 through the amendments to independent claims 1, 15 and 18, the amendments to dependent claims 17 and 20 and the following remarks. While the Office Action indicates that Yanagida shows a soft magnetic underlayer 10₂, the Applicants respectfully submit that 10₂ is not a soft underlayer but rather a hard magnetic recording layer as shown in column 4 at lines 39-42. Applicants' magnetically soft underlayer is located below the hard recording layer of the magnetic storage medium and provides a flux path that enhances the amplitude of the field produced by the main pole. As recited in Applicants' specification on page 1, lines 17-19 "an approach to perpendicular recording requires the use of recording media with a magnetically soft underlayer which provides a flux path from the trailing pole to the leading pole of the writer."

As stated in column 4, lines 10-15 with respect to the reproduction mode of Yanagida, "the fluxes developed from the magnetizing patterns ... are absorbed by the magnetic members 18 and 20." As further stated with respect to the record option of Yanagida in column 7, lines 14, "the magnetic members 18 and 20, and the MR element 14 receive a magnetic flux from the auxiliary magnetic pole 12, and they serve as the main magnetic pole to magnetize the magnetic medium." As stated in column 8, lines 4-7 "although not preferable, either of the two magnetic members 18 and 20 which form the main magnetic pole in the record mode, may be omitted." In both the record and reproduction embodiments of the Yanagida reference, the magnetic members 18 and 20 absorb flux.

The problem addressed by Applicants' invention as recited in Applicants' specification on page 1, lines 22-24 is that "during the read back process, the soft magnetic underlayer produces the image of the magnetic charges in the magnetic hard layer." As stated in Applicants' specification on page 1, lines 24-28, due to the asymmetry between the recording head and its image with respect to the recording layer, the resolution of a perpendicular magnetic recording system with a soft underlayer is usually never better than

the resolution of an equivalent system without a soft underlayer. Furthermore, as recited in Applicants' specification on page 1, line 30 to page 2, lines 1-4, "perpendicular recording designs have the potential to support much higher recording densities than conventional longitudinal designs for various reasons. However, the fundamental resolution degradation due to the use of a soft magnetic underlayer is not a desirable feature because it limits high density recording in a perpendicular magnetic recording system that utilizes a soft underlayer." As previously stated above, Yanagida does not disclose a recording media having a soft underlayer nor does Yanagida disclose that the magnetic members (18 and 20) transmit flux to a soft underlayer.

Independent claims 1, 15 and 18 have been amended to recite that the magnetic flux transmitted to the soft magnetic underlayer by the first magnetic flux generating element flows in an opposite direction within the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the second magnetic flux generating element. As acknowledged by the Examiner on page 6 in Section 10 with respect to claims 3-5 "Yanagida is silent as to the flux flowing in an opposite direction within or away from an area of the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the first and second magnetic flux generating element." Applicants' independent claims 1, 15 and 18 have been amended to include the limitations of original claim 3. Claims 1, 2, 15-18 and 20 are therefore believed patentable.

In Sections 8-10 of the Detailed Action portion of the Office Action, claims 3-6 and 19-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yanagida in view of Lazzari (U.S. Patent No. 5,196,976). Claim 3 has been canceled. Yanagida has been cited as disclosing that magnetic flux is transmitted to the soft magnetic underlayer by first and second magnetic flux generating elements as recited in claims 4-6 and 19-21 except that Yanagida is silent as to the flux flowing in an opposite direction within or away from an area of the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the first and second magnetic flux generating elements. Lazzari has been cited as disclosing that flux flows in an opposite direction within or away from an area of the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the first and second magnetic flux generating element. It was

considered obvious to one of ordinary skill in the art at the time the invention was made to provide the flux of Yanagida flowing in an opposite direction within or away from an area of the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the first and second magnetic flux generating elements as taught by Lazzari to make it possible to read two different resistances corresponding to the resistances of the material for orientation.

Since claims 4-6 depend from claim 1 and claims 19-21 depend from claim 18, this rejection is traversed for the reasons set forth above with respect to the traversal of the rejection of claims 1 and 18 and for the following reasons. It is respectfully submitted that the present invention as defined by claims 4-6 and 19-21 contains a combination of elements that is neither disclosed nor suggested by the cited references.

As discussed above, Applicants respectfully submit that Yanagida does not disclose, teach or suggest the use of a recording media having a magnetically soft underlayer. Lazzari teaches that leakage flux ϕ_1 from the recording layer passing in front of the head is detected by the monopole and is subdivided into two fluxes ϕ_2 and ϕ_3 moving in opposite directions. Claims 4-6 depend from claim 1 and claims 19-21 depend from claim 18. Claims 1 and 18 have been amended to recite that the magnetic flux transmitted to the soft magnetic underlayer by the first magnetic flux generating element flows in an opposite direction within the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the second magnetic flux generating element. Lazzari does not teach or suggest a first magnetic flux generating element wherein the first magnetic flux generating element transmits a magnetic flux into the soft magnetic underlayer, a second magnetic flux generating element wherein the second magnetic flux generating element transmits a magnetic flux into the soft magnetic underlayer such that the magnetic flux transmitted to the soft magnetic underlayer by the first magnetic flux generating element flows in an opposite direction within the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the second magnetic flux generating element as recited by claims 4-6 and 19-21. Furthermore, Lazzari does not teach or suggest that the magnetic flux transmitted to the soft magnetic underlayer by either the first or second magnetic flux generating elements flows in the soft magnetic

underlayer away from an area of the soft magnetic underlayer beneath the read element as recited by dependent claims 4 and 5. If the structure of Figure 10 of Lazzari were placed adjacent to a magnetic recording medium having a soft underlayer, the magnetic flux in the soft underlayer would be directed toward the read element. Therefore, Lazzari teaches away from the present invention as defined by claims 4 and 5.

Yanagida teaches as stated in column 4, lines 10-15 with respect to the reproduction mode of Yanagida, "the fluxes developed from the magnetizing patterns ... are absorbed by the magnetic members 18 and 20." As stated with respect to the record option of Yanagida in column 7, lines 14, "the magnetic members 18 and 20, and the MR element 14 receive a magnetic flux from the auxiliary magnetic pole 12, and they serve as the main magnetic pole to magnetize the magnetic medium." Yanagida does not teach or suggest that magnetic flux transmitted to the soft magnetic underlayer by the first magnetic flux generating element flows in an opposite direction within the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the second magnetic flux generating element. Furthermore, since the cited references do not address the problem solved by this invention, the references do not teach or suggest that such a combination would be intended or beneficial.

Neither Yanagida nor Lazzari teach or suggest the curving boundary layer of the soft magnetic layer as recited in claim 21. Furthermore, neither Yanagida nor Lazzari teach or suggest that an air bearing surface of the first and second magnetic flux generating elements is spaced from a boundary layer of the soft magnetic underlayer a distance of from about 5 nm to about 10 nm.

The Applicants respectfully submit that there is nothing in the teachings of the cited references that indicates that the structure recited in Applicants' claims wherein the magnetic flux transmitted to the soft magnetic underlayer by the first magnetic flux generating element flows in an opposite direction within the soft magnetic underlayer than the flow of the magnetic flux transmitted to the soft magnetic underlayer by the second magnetic flux generating element would be provided if the magnetic members of Yanagida was modified to include the split auxiliary flux from the recording layer of Lazzari.

In Section 11 of the Detailed Action portion of the Office Action, claims 7-14 have been objected to as being dependent upon a rejected base claim, but allowable if

rewritten in independent form including all of the limitations of the base claims and any intermediate claims. Original claims 7-14 have been rewritten as new claims 22-29 and are believed patentable in their rewritten form.

All claims in the application are believed to be in allowable form.
Allowance of the application is requested.

Respectfully submitted,

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